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CAPILLARIA SP.

FROM CRYPTOTIS PARVA
(TITLE)

BY

JOSEPH N'DONG

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

Master of Zoology

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

1978
YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
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25 Aug. 1978
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DEPARTMENT HEAD

The undersigned, appointed by the Chairman of the Department of Zoology, have examined a thesis entitled

Capillaria sp. from *Cryptotis parva*

Presented by

Joseph [n]'Dong

a candicate for the degree of Master of Zoology and hereby certify that in their opinion it is acceptable.

22 Aug 1978

26 Aug 1978

26th of August, 1978

Aug 27, 1978

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ABSTRACT

Twenty-nine Cryptotis parva were trapped at Lincoln Log Cabin State Park in Coles County Illinois between 22 December 1976 and 31 January 1978. Trapped specimens were necropsied and examined for the presence of helminth parasites. Nematode infections were found to be present in eight (27.2%) of the shrews collected with five (17.2%) of the males and three (10.3%) of the females infected. Three adult female nematodes were recovered from the small intestines of the host specimens, described and identified as the genus Capillaria. No male Capillaria were obtained and therefore species identification was impossible. However, the general appearance of the three female nematodes recovered, suggest that they may include two different species. Cestodes of the genus Hymenolepis were also recovered from nine shrews.

ACKNOWLEDGMENTS

I wish to sincerely thank Dr. B. T. Ridgeway (advisor) for his continuing guidance and support which have made the production of this thesis possible. Thanks also go to Dr. Richard Andrews for providing traps and offering valuable advice on collecting methods and selection of trapping sites. Appreciation is extended to Dr. Jaime Maya for confirming the identification and sex of host shrews. In addition to the above, I wish to express my gratitude to Dr. Richard Funk, Dr. Verne Kniskern, Dr. Patrick Docter and Dr. Garland Reigel for assisting in the editing of this paper.

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INTRODUCTION

The genus Capillaria (subfamily Capillariinae, family Trichuridae) was established in 1800 by Zeder on material recovered from poultry. The type species is Capillaria anatis (Schrank, 1790). Since then Capillaria have been reported from numerous vertebrate hosts throughout the world. Yamaguti (1961) listed 37 species in fish, 13 in amphibians, 13 in reptiles, 104 in birds and 88 in mammals. Few infections have been reported in humans (MacArthur, 1924; Morishita and Tani, 1960). Twenty-two species of Capillaria are reported from insectivores (Lopez-Neyra, 1947; York and Maplestone, 1926; Travassos, 1915; Teixeira De Freitas and Lent, 1936; Skryabin, Shikhobalova, and I. V. Orlov, 1957; and Yamaguti, 1961). Eighteen species have been described from Soricidae, particularly the genera Sorex, Blarina, Crocidura and Suncus.

Two authors in North America have worked with Capillaria of Soricidae. Ogren (1953) described Capillaria blarinae from the esophagus of Blarind brevicauda in Illinois and Read (1949), in his studies on North American species of Capillaria, described Capillaria taushi from the small intestine of Sorex cinereus at Madison, Wisconsin. No Capillaria have been reported in Cryptotis parva.

MATERIALS AND METHODS

Cryptotis parva were trapped at Lincoln Log Cabin State Park in Coles County Illinois between 22 December 1976 and 31 January 1978. Forty-four museum special snaptraps and twelve Sherman live traps were set in pairs at 10 foot intervals. Traps were baited with peanut butter and checked daily. Trap lines were moved at 6 day intervals.

Trapped specimens were killed with ether (if alive), weighed and sexed. Body cavities were opened and scanned for nematodes. Alimentary tracts were removed, covered with mammalian ringer's solution in a petri dish and opened. The mucosa of each tract was examined for parasites and then gently scraped with a dissecting needle. Scrapings were transferred to a microslide with a drop of ringer's solution and examined microscopically for parasites and eggs. The remaining medium in each petri dish was decanted and the sediment examined. Digestive tract remains were put into migration jars as described by Matthews (1974) to recover parasites which may have been overlooked in the former examinations. The urinary bladder of each specimen was removed, opened on microslide and examined microscopically for parasites and eggs. The liver was carefully examined at necropsy for the presence of leisons and small sections of each organ were examined microscopically for eggs or cysts. Fecal samples were examined according to the method of Levine (1973).

All nematodes removed were cleared with lactophenol on microslides and identified. They were later stored in 70% ethanol containing 4%

glycerine. Cestodes were fixed in A.F.A. (alcohol-formol-acetic fixative) and stained by Cable's (1958) technique. Identification of cestodes was based on Yamaguti (1959). Nematodes were identified using Levine (1968), Schrabin, et al (1957), and Yamaguti (1961).

RESULTS

Twenty-nine Cryptotis parva were trapped. Seventeen were males and 12 were females. All specimens appeared to be mature. Their weights ranged between 3.65 grams and 5.85 grams with the average for males being 4.42 grams and that for females being 4.58 grams. Nematode infections were present in eight (27.6%) of the shrews collected with five (17.2%) of the males and three (10.3%) of the females infected.

Only three adult females of the genus Capillaria were encountered. Two were recovered from the small intestine of one male shrew and appeared to be of different species. A worm similar in size and appearance to one of those collected from the male was removed from a female host. No male nematodes were seen. Capillarid eggs were observed in the feces of four male shrews and two female shrews. However, necropsy revealed no worms.

Description of the Two Kinds of Capillaria

Capillaria sp. #1

Female: Body slender, tapering gradually towards the anterior end. Mouth is simple and slightly subterminal. The tail is curved and blunt. Bacillary band absent, cuticle with fine transverse striations and rectum muscular opening at a terminal anus. The sticocytes line the entire esophageal region, have centrally placed nuclei, and are rectangular with crenulated outer margins. The nerve ring could not be detected.

The body is 18.44 mm long and 0.01 mm wide at the head. Greatest diameter is 0.1 mm at the posterior half 5.73 mm from the caudal end. The esophgus is 4.68 mm long and at its base the worm measures 0.07 mm in width. The sticocytes averaged 0.11 mm in length and 0.0028 mm in breath. There is a single ovary and uterus which is filled with eggs at various stages of development. In the posterior portion, the eggs are pressed together, transverse to the tube or oblique, only in the area closest to the vagina are eggs parallel with the tube wall. The vulva is located on a slight prominence 0.08 mm in diameter and 4.72 mm from the anterior end. Just posterior to the vulva and also just anterior to it, the width is 0.07 mm. The rectum measures 0.07 mm in length.

The oval, smooth walled, double pluged eggs in the uterus are brownish orange in appearance and unsegmented. The three eggs average 0.059 mm in total length and 0.0028 mm in diameter. The length of plugs average 0.006 mm. The egg shells measure from 0.0013 mm to 0.0018 in thickness.

Capillaria sp. #2

Female: The worm is threadlike with the esophageal region more attenuated than the rest of the body. The oral cavity is simple and terminal. The posterior extremity is curved and blunt. No bacillary band has been observed, cuticle is finely striated transversely and rectum opens at the anus terminally. The sticocytes flank the entire esophagus, have central nuclei which are quite distinct for the most part, and are rectangular with crenulated outer margins. The nerve ring could not be detected.

The body is 18.25 mm in length and 0.07 mm wide at its greatest diameter 3.38 mm from the posterior end. The width of the head is 0.01 mm and that of the anal region is 0.03 mm. The indistinct esophagus

measures 4.67 mm in length and at its base, the width of the worm is 0.05 mm. The sticocytes averaged 0.092 mm long and 0.0022 mm wide. The vulva with its unsalient lips, is located 4.75 mm from the anterior end and situated on a slight prominence 0.62 mm in diameter. The single uterus contains eggs at various stages of shell formation, many of which are arranged in single file along its entire proximal portion. The length of the rectum could not be clearly determined.

The eggs in utero are orange in appearance and unsegmented. Six eggs measured average 0.058 mm in total length and 0.027 mm in width. The egg plugs average 0.0056 mm in length while the shells range from 0.0013 mm to 0.0015 mm in thickness.

The cestode proglottids appeared to be those of Hymenolepis. However, further study of entire worms is necessary for definite identification.

Capillaria sp. from Digestive Tract of *Cryptotis parva*

Fig. I Posterior End *Capillaria* sp. #2

Fig. II Posterior End *Capillaria* sp. #1

Fig. III Anterior End *Capillaria* sp. #2

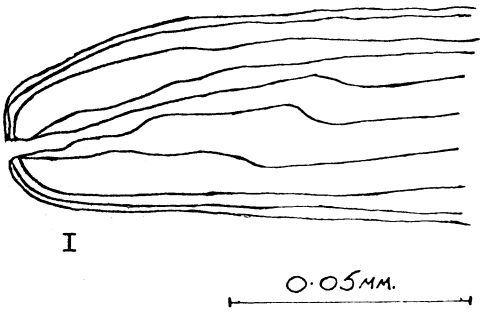
Fig. IV Anterior End *Capillaria* sp. #1

Fig. V Vulvar Region *Capillaria* sp. #2

Fig. VI Vulvar Region *Capillaria* sp. #1

Fig. VII Egg from Uterine Tract of *Capillaria* sp. #1

Fig. VIII Egg from Uterine Tract of *Capillaria* sp. #2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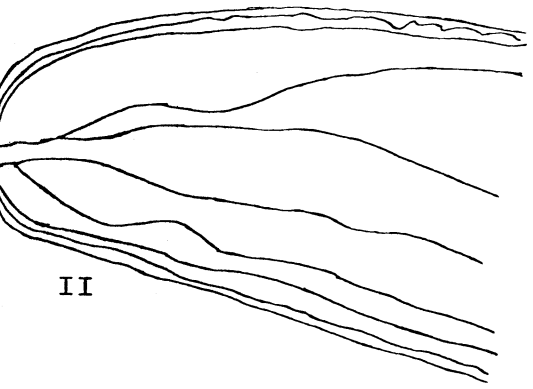
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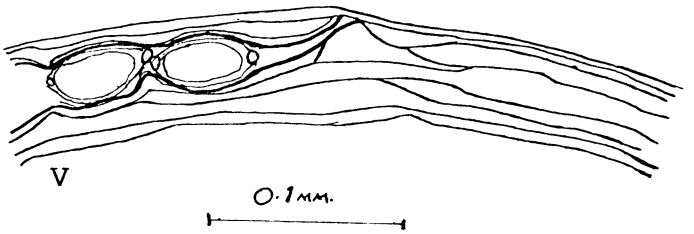
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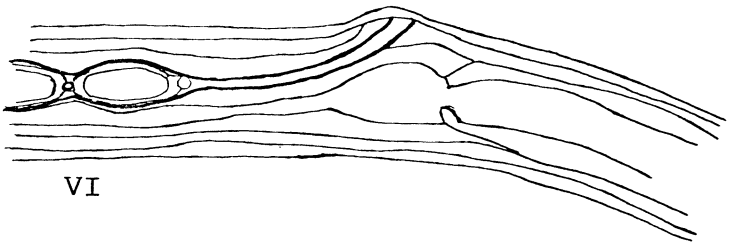
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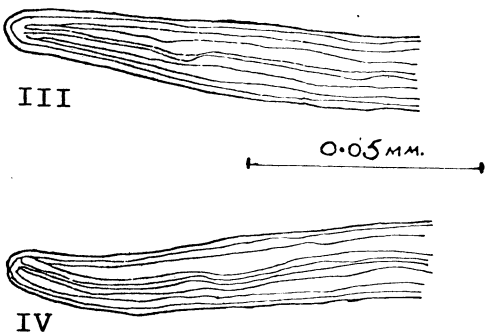
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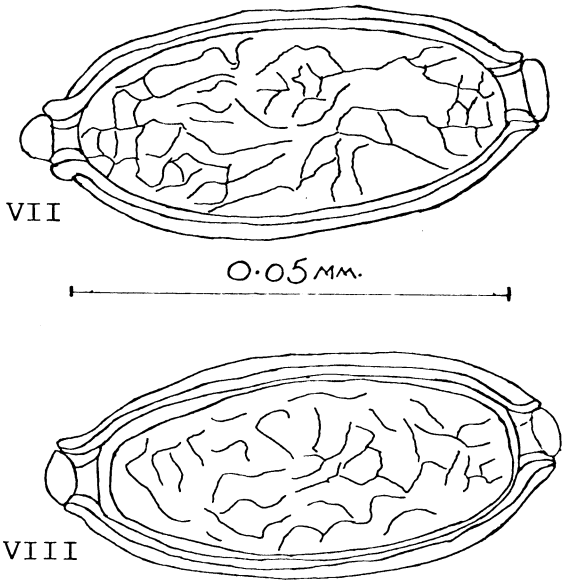
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DISCUSSION

Cryptotis parva were difficult to collect. Over a period of 13 months (December 1976 - January 1977), 28 specimens were caught. One additional shrew was captured in January 1978. No specimens were collected after the heavy snow storms arrived late February 1977 and 1978 leaving heavy snow cover on the ground for several weeks. The severe weather may have caused a mass winter kill both years. Considering their high metobolic rate, and the need to feed constantly, bad weather for an extended period of time may produce widespread starvation. Another possibility may be that many were either drowned in their holes or flushed out as the snow rapidly melted. With the vegetation no longer offering adequate cover or protection, flushed out animals may have been heavily preyed upon by owls and other potential predators.

Only three adult female Capillaria were recovered during the necropsies. This is a low adult recovery rate when compared to other hosts. A number of reasons for this may be cited. Read (1949) indicated that species inhabiting the digestive tract are often found when the mucosa is thoroughly scraped. However; the small size of the specimens in question and their fragile nature may have allowed some to be overlooked. Since no fragments were observed, it is probably that the above is not the case. The fact that eggs were present did not necessarily mean presence of adults. Levine (1968) mentions that if a specimen has eaten an infected host, eggs from helminths of prey may be found in the predator feces. But, in this investigation, the eggs recovered from hosts in which there

were no worms, appeared to be the same as those examined from the hosts with worms and as those found in the uterine tract of egg bearing female worms. It is therefore concluded that the level of infection in these host specimens is low.

The fact that no males were recovered in this study is not uncommon. Levine (1968) and Hesse (1923) mention several instances where males of described Capillaria species are unknown. Considering the fact that females outnumber males in host populations by almost 3 to 1 on the average and the males are much smaller, it is not surprising that males are less often observed than females.

Although Capillaria hepatica has been reported from the livers of seven orders and 35 species of mammals (Teixeira De Freitas and Lent, 1936; Lubinsky, 1956; Freeman and Wright, 1960; Solomon and Handley, 1971), no evidence of liver inhabiting forms were found in this study.

The method by which many capillarid infections are acquired is unknown. Hyman (1951) stated that some species in this genus require earthworms as intermediate hosts. Others may have direct life cycles.

The Capillaria described here appear to be of two different species. Several points of difference may be summarized. (1) The oral cavity of Capillaria #1 opens subterminally while that of Capillaria #2 is terminal. (2) Their sticocytes are of different average size. (3) The egg arrangement in the uterus is different and so are their average egg sizes. (4) The prominence in the vulva region is more marked in one than in the other. (5) The slight decrease in width posteriorly from the region of greatest diameter is more readily observable in one than in the other.

On the other hand, they could be the same species based on the fact that (1) the morphology of their sticocytes are similar, (2) the ratios

of their esophagi and vulvas to their body lengths are the same, (3) the nature of their cuticles is similar, and (4) they both lack bacillary bands.

Until male specimens can be obtained, the determination of species will be reserved.

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